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FOREST INSECT INVESTIGATIONS

RELATION OF INSECTIVOROUS BIRDS TO THE MORTALITY OF THE MOUNTAIN PINE BEETLE DURING THE FLIGHT PERIOD

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INTRODUCTION

Very little information is available concerning the flight habits of Dendroctonus monticolae and of the mortality believed to occur between the time of emergence and attack. Insectivorous birds have been considered beneficial in destroying a certain per cent of the adult beetles during their flight period. In order to secure some definite information on this subject a study of the relation of insectivorous birds to the mortality of the mountain pine beetle during its flight period was included in the investigative program of the Coeur d'Alene Forest Insect Field Station for the season of 1928. In connection with this study the writer collected a small series of insectivorous birds during part of the mountain pine beetle flight period in August, 1928, on the Bitterroot National Forest, 12 miles east of Sula, Montana. This study was made possible through the cooperation of the Fish and Game Department of the State of Montana in issuing a special collecting permit to the Bureau of Entomology, and the Bureau of Biological Survey, Washington, D. C., for the correct determination of the food contents of the stomachs and gullets of the birds collected.

SCOPE

Several species of woodpeckers had become well established in the area where collection was made, owing to the abundant and continuous food supply. It is a well known fact that woodpeckers destroy a large number

of larvae and pupae of the mountain pine beetle during the late fall and winter months, but it is not definitely known if they feed to any great extent on the new adults between the time of emergence and attack.

As nighthawks are known to secure the bulk of their food on the wing, they were included in the list of birds collected. A greater portion of the mountain-pine-beetle-infested area on the headwaters of the East Fork of the Bitterroot River consists of steep mountain slopes covered with dense stands of lodgepole and yellow pine, and very few nighthawks inhabit this vicinity as they generally prefer more open country.

A total of 18 birds was collected between the dates of August 4-9, consisting of 10 nighthawks, 2 red-shafted flickers, 3 alpine three-toed woodpeckers, 2 Rocky Mountain hairy woodpeckers, and 1 Rocky Mountain nuthatch. A complete analysis of the stomach and gullet contents, as determined by the Bureau of Biological Survey, brought out the fact that the food of 17 of the birds consisted of 100 per cent animal matter, and that of the other bird, 94 per cent animal and 6 per cent vegetable matter. The animal matter consisted entirely of insects and a list of the orders represented, with number of species and insects, is as follows:

Order	No. of Species	No. of Insects
Arachnida	4	8
Ephemerida	1	1121 Mayflies
Neuroptera	1	4
Trichoptera	1	334
Hemoptera	5	8
Hemiptera	6	12
Coleoptera	45	1242 - 771 D.m. adults
Diptera	25	398
Plecoptera	1	7
Lepidoptera	3 ?	44
Hymenoptera	24	6018 - Ants, 5979
Unknown	3	8
Total 11	119	9204

This list shows that the greatest number of insects consumed as food belonged to the orders Ephemerida, with 1 species consisting of mayflies to the number of 1121; Coleoptera, represented by 45 species with a total of 1242 insects, 771 of which were adult Dendroctonus monticolae beetles; and Hymenoptera, with 24 species and 6018 insects, of which 5979 were various species of ants. The proportion in per cent of the various insects taken by all the birds as food is divided as follows:

Ants	64.9	per cent
Mayflies	12.1	" "
D. monticolae	8.37	" "
All other insects	14.63	" "
	100.0	" "

The proportion in per cent of the various insects taken by the 10 nighthawks is:

Ants	50.0	per cent
Mayflies	12.1	" "
D. monticolae	8.22	" "
All other insects	12.0	" "
	82.32	" " of total insects

The number of Dendroctonus monticolae adults consumed by the birds as food represented 8.41 per cent of the total number of insects and 62 per cent of the total number of Coleoptera.

List of birds by species, with date of collection and volume in per cent of Dendroctonus monticolae adults taken as food:

Date 1928	Hour Collected	Specimen No.	Species	No. of D.m. taken as food	Volume of food
8/4	7 p.m.	1	Nighthawk	51	18%
8/5	3:30 p.m.	2	Rocky Mtn. hairy woodpecker	0	0
8/5	7:30 p.m.	3	Nighthawk	2	Fragments
8/5	8:00 p.m.	4	"	3	6%
8/5	8:10 p.m.	5	"	8	3%
8/6	10:00 a.m.	6	Alpine three-toed woodpecker	1	4%
8/6	10:05 a.m.	7	Rocky Mtn. nuthatch	3	10%
8/6	11:00 a.m.	8	Alpine three-toed woodpecker	2	10%
8/6	7:30 p.m.	9	Nighthawk	139	10%
8/6	8:15 p.m.	10	"	289	20%
8/6	8:30 p.m.	11	"	102	5%
8/7	10:00 a.m.	12	Red-shafted flicker	0	0
8/7	10:05 a.m.	13	" " "	0	0
8/7	7:45 p.m.	14	Nighthawk	91	10%
8/7	8:15 p.m.	15	"	66	12%
8/7	8:30 p.m.	16	"	6	Fragments
8/8	9:00 a.m.	17	Alpine three-toed woodpecker	5	8%
8/8	11:30 a.m.	18	Rocky Mtn. woodpecker	3	3%
Total			18	771	

This list shows that of the 18 birds collected 15 of them had consumed D. monticolae adults in varying numbers from 1 to 289, and in per cent of food volume from a few fragments to 20 per cent. While specimen No. 2 (Rocky Mountain hairy woodpecker) had eaten no D. monticolae adults, its food contents showed a volume of 78 per cent of Cerambycidae larvae and adults. The two red-shafted flickers had taken only various species of ants for food. The greatest number of adult mountain pine beetles was found in the stomachs of nighthawks numbered 9, 10, and 11, collected between the hour of 7:30 p.m. and 8:30 p.m. on August 6. The gullets of these birds were partly filled with various species of insects taken

during the feeding period prior to the time when killed. These gullets contained no mountain pine beetle adults, and it is possible that the large number contained in the stomachs was taken as food the day before, or, possibly, feeding may have occurred during the afternoon of the sixth as the nighthawks often fly about in the daytime and these particular specimens may have at that time encountered a flight of D. monticolae. As information concerning the digestion period for nighthawks is lacking, it is not possible to form any definite conclusions as to the exact time these birds secured the mountain pine beetle adults.

CONCLUSIONS

Of the five species of birds collected for this study, the nighthawks seem to be the most beneficial in the destruction of the mountain pine beetle adults during their flight period. While the alpine three-toed woodpeckers appear next in importance, their greatest value occurs during the fall and winter months when they destroy great numbers of D. monticolae larvae. This applies also to the Rocky Mountain hairy woodpecker. Though nighthawks were found to be very beneficial, they occur in such small numbers in the mountain-pine-beetle-infested region as to be of little importance in controlling D. monticolae epidemics.

Respectfully Submitted,

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